Richmond Refinery LPS Bulletin – Reliability

Seal Failure When Spare was Unavailable

Impact ERM: 32285

Location:
Hydroprocessing – 18 Plant
- P-1831 sour NH_3 Pumps

Contact Information:
John Lizarraga
510-242-3478
JLFI@Chevron.com

Reference:
Investigation #148550

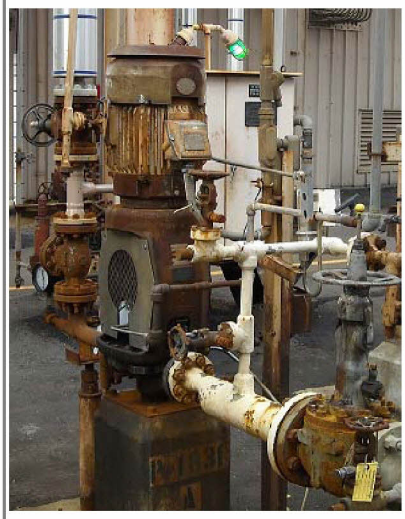

Photo of P-1831A as installed in the field..

Tenets of Operations Violated:

Tenet #10 – Always involve the right people when evaluating the impact of process or design changes

Incident Description:

P-1831A (spare for P-1831) had been put in service and ran 7 days when it was discovered that the seal was excessively leaking on the morning of 2/25/12. It was then determined by operations to shutdown the pump as it could not continue to run reliably due to the leak. P-1831A was shutdown and isolated, and due to the fact that both pumps were out of service, the plant had to be shutdown. Repairs were made and P-1831 was returned to service within 2 days.

Subsequently, a second seal failure occurred on this pump on 6/22/12 resulting in a clock reset. This failure was of the same mode as identified from the previous investigation.

Investigation Findings:

1) In 1984 the seal design for these pumps was changed from a dual pressurized seal (API plan 53A) to a single seal with a process flush and a water flush (API plan 11 and 23) – no information on the reason for this change could be located.
2) The new seal design requires both flush streams running to keep product from flashing across the seal faces and causing them to leak – however, the water flush contaminates the product and is routinely shutoff by operations to protect the process.
3) Pumps were not resized during the TURBO project at RLOP in 2007 - The pump cavitates often, especially during startup, which is known to contribute to seal failures.
4) Although there is a history of high seal failure rates on the P-1831 pumps at 18 Plant, past investigations had not found the root causes of the failures.

Lessons Learned / Business Practices:

1) More robust seals and seal support systems are available that promise improvements in seal reliability without diluting the process stream.
2) Pump sizing needs to be considered when process changes are made.
3) **Although these failures have had low EDC impacts to the Refinery, the long term repairs and modifications have been re-prioritized and accelerated to work to avoid further clock resets.**

Recommendations:

1) Run a hydraulic analysis for the P-1831's to identify the root cause of cavitations during start-up. Use the results to determine if the pumps are oversized.
2) Investigate seal flush system to determine if system is adequate for plant operation.
3) Change to dual pressurized seals on P-1831 and P-1831A with API Plan 53A Flush. Upgrade to API 682 seal if available to fit this pump.
4) Use the MOC process to facilitate reviews and keep records of changes associated with seal modifications.